AR-483

Interactive conceptual design of structural forms

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Cursus	Sem.	Type
Architecture	MA1, MA3	Opt.

Language	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	12
Hours	**3 weekly**
Lecture	2 weekly
Exercises	1 weekly

Summary

The class exposes students to the geometric design of material efficient architectural structures. The focus is placed on the conceptual exploration of a rich, diverse solution set. Hand-controlled methods and parametric tools are used, as well as strategies to rapidly take key decisions.

Content

- Introduction to the value of structural geometry towards the architectural project;
- Introduction to the role of design-oriented assumptions in engineering;
- Strategies for selecting and transforming load-bearing systems;
- Principles of structural design-oriented physical models;
- Formal explorations using graphic statics and force paths;
- Introduction to parametric modelling and form-finding tools;
- Historical illustrations of interactive structural design exploration.

Keywords

- Architectural structures
- Interactive conceptual design
- Force shaping
- Ressource-efficiency
- Parametric design

Learning Prerequisites

Required courses

EPFL bachelor classes on statics, structural design or equivalent.

Learning Outcomes

By the end of the course, the student must be able to:

- Choose a structural system that is relevant to given architectural, technical and environmental contexts
- Sketch a wide variety of structural forms that originally address specific issues
- Infer the geometric degrees of freedom in a given structural typology
- Use a computational tool for graphical parameterization

- Identify structural solutions that require less material for construction
- Modify a structural solution to enhance its mechanical behavior

Transversal skills

- Use a work methodology appropriate to the task.
- Communicate effectively with professionals from other disciplines.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Set objectives and design an action plan to reach those objectives.

Teaching methods

- Lectures on board or slides
- Discussions based on readings
- Theoretical and hands-on exercises, in class and homework assignments

Expected student activities

Regular work throughout the full semester and interaction in the class room.

Assessment methods

The class is punctuated by four assignments:
1. physical and numerical design of shells (15%);
2. parametric design of simply-connected networks (15%);
3. parametric design of reticulated systems (15%); and
4. conceptual design project (35%)

The final oral exam is worth the remaining 20%.

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Bibliography

Form and Forces / Allen & Zalewski

Ressources en bibliothèque

- Form and forces / Allen & Zalewski

Notes/Handbook

Slides and readings will be published on Moodle.

Websites

- http://sxl.epfl.ch/teaching

Prerequisite for

Projet de master